Using meteorological measurements from different sources to evaluate the human comfort in urban area

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Table 1. Selected heat—stress indices', temperature limits [°C] in reference to thermal sensations and alert description for WBGT and HI (modified from [2])

THERMAL SENSATIO	ALERT DESCRIPTION	INDEX				
		WBGT [°C]	HI [°C]	PET [°C]	PMV	UTCI [°C]
Neutral	Generally safe	<18		18-23	-0.5-0.5	9-26
Warm	Caution	18-24	27-32	23-35	0.5-0.25	26-32
Hot	Extreme Caution	24-28	32-41	35-41	2.5-3.5	32-38
Very hot	Danger	28-30	41-54	>41	>3.5	38-46
Sweltring	Extreme Danger	>30	>54			>46

Figure 1. Position of the INAMHI's Automatic Weather Station in South of Ecuador

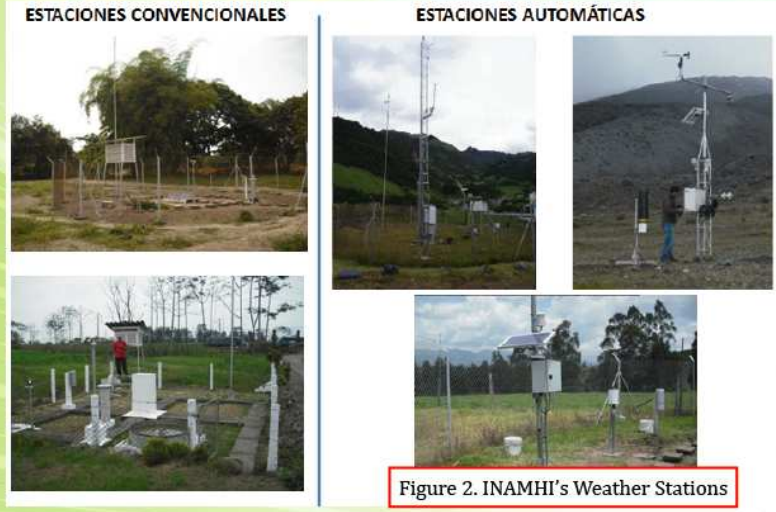

Figure 2. INAMHI's Weather Stations

Climate change affects the thermal and human comfort in urban areas. This is more evident in equatorial towns that have experienced, in the last decades, of an increase of air temperature which, acting together with the increasing of the rain rate, generates a strong deterioration of the human comfort.

The characterization of the urban heat island is one of the most important points in the agenda of the Research Centers, as well as of the Weather Services of the Nations located in the equatorial area.

The Escuela Superior Politecnica del Litoral (Ecuador), jointly with the Instituto Nacional de Meteorologia e Hidrologia (INAMHI - Ecuador) and with the Politecnico di Torino and the Università di Torino (Italy), started a project devoted to the analysis of the thermal comfort in the Guayaquil urban area. The research is funded by the Secretaria de Educacion Superior, Ciencia, Tecnologia e Innovacion (SENESCYT – Ecuador) in the context of the PROMETEO project.

The preliminary results of this research show us how, to better describe the thermal comfort in the urban area, it is important to have available the meteorological parameters measured by a meso-network of Automatic Weather Stations. The elaboration of these measures with the Universal Thermal Climate Indices, like the PMV and the PET ([1],[2]), provide a detailed analysis of the thermal comfort and of the related human comfort in the urban area.

Reference

[1] Matzarakis, A., Rutz, F., Mayer, H., 2010. Modelling Radiation fluxes in simple and complex environments: basics of the RayMan model. Int J Biometeorol., 54:131-139.

[2] Blazejczyk, K., Epstein, Y., Jendritzky, G., Staiger, H., Tinz, B., 2012. Comparison of UTCI to selected thermal indices. Int. J. Biometeorol., 56:515-535

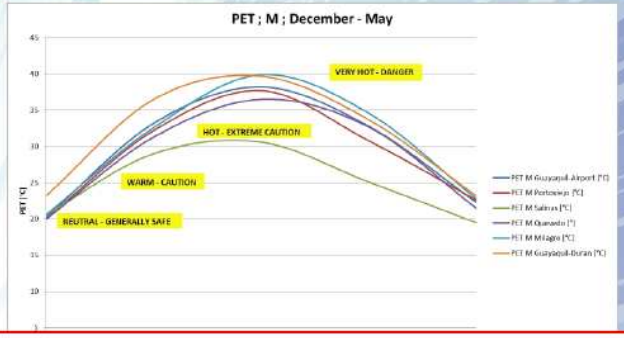

Figure 3. Evaluation of the PET thermal comfort index in different weather stations in South of Ecuador for the "rainy season" (man gender)